

on the gradual decreasing of the disturbance, there exists the probability that at the time of A. Ångström's measurements in California (August/September, 1913) * there were also dust masses prevailing in the higher atmospheric strata. Considering the great theoretical importance Ångström's final results have for the understanding of the radiation of the highest atmospheric strata * and, what is of more immediate interest, for their ozone content, depending undoubtedly on the degree of sun's activity, new measurements in optically undisturbed times will be needed.

I may be allowed to point out another fact: If A. Ångström's new actinometer for sky radiation ¹⁰ proves useful and magnesium oxide really very well absorbs the wave lengths greater than 4μ , then the necessary means to shelter the Stevenson shelter against radiation influence would be found. Long series of observations not yet published have proved how much the shelter needs this protection in a genuine radiation climate like that of Davos, where intense radiation is combined with low air temperature. The following unpublished figures will show that in these conditions of radiation color offers but little protection to the raw material beneath it. The experiments were made in the period from October, 1913, to January, 1914 (that is to say, low sun altitude), with hollow boxes of wood of cylindrical shape 3 cm. high and 2 cm. in diameter set up in a place entirely protected against reflected radiation and wind and free on all sides. They were filled with mercury to a level where the sun's rays could not strike the surface. In this mercury the thermometer bulb was freely suspended. The boxes were painted in the following colors: White, pink, yellow, red, and black. The result obtained was as follows. The addition of a calorie of radiating heat produced the following rise of temperature:

	° C.
White.....	10.8
Pink.....	11.0
Yellow.....	14.8
Red.....	15.7
Black.....	16.9

What is remarkable in this is the fact that wood remains a great heat collector also when it is painted with best reflecting white color, and that the color does not have so great an effect as is generally believed; for the dark color only adds 6° to the 11° temperature increase which the wood undergoes under the white paint. It is therefore more important that the material of the building be well chosen than the color. When absolute calm prevails, the temperature of the air is not of great influence during this one-sided insolation, but with the air in movement loss of heat sets in through conduction, and 30 per cent of the irradiating heat (roughly speaking) is lost when the air movement is slight, and 60 per cent when the movement is of mean degree. With the more strongly absorbing dark colors this loss is noticeably slower than with the light ones. If, on the other hand, reflex radiation from light walls of the neighborhood intervene, the unchanged free exposure being continued, that is to say, the box of wood being on all sides washed by the air the heat increase of the dark colors amounts to one-third, that of the lighter ones to one-fifth. If the increase of heat radiation ceases at sunset, the temperature of the dark colors decreases quicker, according to their greater surplus over the temperature of the ambient air, especially for the first 10 minutes; after 20 minutes the temperature of the dark colors exceeds that

of the air about $3\frac{1}{2}^{\circ}$ against $3\frac{1}{2}^{\circ}$ for the lighter colors; after 40 minutes about 2° against 1° . The loss of heat is very slow as may be seen.

Finally, an exceedingly ingenious test for the investigations in infrared may be mentioned; that is, the use of bacteria which react very keenly at spectrum line's breadth. These can be advantageously substituted for the photographic plate more or less satisfactorily in this part of the spectrum.

A WATERSPOUT IN THE ADIRONDACKS.

The United States Weather Bureau meteorologist at Albany, N. Y., Mr. George T. Todd, has reported an interesting and unusual waterspout which was observed on Lake Newcomb in the Adirondack Mountains. On the afternoon of May 16, Mr. F. W. Kelly, of Albany, and several others observed a whirl of water which appeared to be a partly formed waterspout. The column of water was about 4 feet in height and about as large in diameter as a flour barrel. It moved across the lake from northwest to southeast, whirling counterclockwise. There appeared to be no unusual atmospheric disturbance on shore before the waterspout started, but, beginning where the water was about a foot deep and progressing across the lake where a depth of 3 or 4 feet, the spout ended with a considerable splash on the opposite shore. A depression in the water level near the spout was also observed. The center of the whirl passed within 20 to 25 feet of Mr. Kelly, but no unusual atmospheric condition was noticeable. He said there was a sound of rushing water similar to that made by turning the water from a high pressure fire hose on another body of water.—C. L. M.

TORNADO IN UNION COUNTY, N. C., JUNE 20, 1920.

At 2 p. m. of June 20 a tornado of considerable violence formed in the southwestern part of Union County, approximately 22 miles south-southeast of Charlotte, seriously injuring one person, demolishing eight dwellings and a number of barns and outbuildings, and inflicting considerable damage to cotton fields, crops, and timber. The total damage is estimated at about \$30,000.

The storm apparently began a short distance south of the village of Waxhaw and ended at or near Wesleys Chapel, having followed a northeasterly path about $7\frac{1}{2}$ miles long and about 200 feet wide.

It is possible that the inception of this tornado was witnessed by Mr. and Mrs. Rock Morrison, who were traveling by automobile from Miami, Fla., to Charlotte. At 2 p. m. of the above date they stopped at the Osceola Creek bridge to adjust a tire, and their experiences there are reported in the Charlotte News as follows:

"While the automobile was standing, Mrs. Morrison observed a small whirlwind stirring up the leaves on the top of a small hillock about a quarter of a mile away. It dipped toward the surface of the ground for a moment and appeared to lift a few feet above the surface for a moment. This was indicated by the leaves and stubble once picked up fluttering back to earth. Presently, however, there was a noticeable quantity of leaves and stubble flying in the air, and Mrs. Morrison directed her husband's attention to it.

"In a moment the tiny whirlwind had resolved itself into a swirling tornado, which became black with leaves, sticks, twigs, and limbs of trees and debris of various kinds, as it started a rapid sweep across the landscape with an ominous roar.

"Awestruck at the unusual sight, Mr. and Mrs. Morrison watched the cloud, which was clearly funnel-shaped, sweep over the country and pick up a house which it smashed, hurling bits of the shingle roof, window sash and other bits of wood high in the air. It twisted trees into tooth brushes of colossal size, and cut a swath through the forest and over fields as distinct as if some giant with a scythe had

* Smithsonian Miscellaneous Collection loc. cit. Hergesell, Abhandl. Aeronaut. Observ. Lindenberg, Bd. XIII, 1919.

¹⁰ MONTHLY WEATHER REVIEW, 1919, 47: p. 795.

done the work. The phenomenon swept on across the country out of sight."

Passing within half a mile of Waxhaw, the storm did no damage there, but seems to have been at its greatest intensity $2\frac{1}{2}$ miles northeast of that place, in what is called the Howie Gold Mine district.

Here the home of B. P. Hancock was completely destroyed, and one of the children, Ella Hancock, seriously injured by flying timbers. The other members of the family sustained minor injuries. Two tenant houses in this vicinity were wrecked, one of which was occupied by Raymond Paxton and his family. That no one was injured is probably due to Mr. Paxton's precaution in taking his family to a deep road ditch, in which they lay flat.

At the Howie mine a negro cabin was demolished, the occupants having taken refuge in an old mine shaft. The old mill house was blown down on five mules, one of which was killed and others injured. A yearling heifer was also killed. Large oak trees were twisted and torn out by the roots, the tramway from the shaft to the mill house was wrecked, and roofs and chimneys of other buildings were blown off.

From the Howie mine the tornado continued northeastward for about 4 miles through a sparsely settled district, apparently coming to an end near Wesley's Chapel, which is 8 miles southwest of the place where the April tornado began.

The following descriptions of weather conditions attending the movement of this tornado have been received:

From Lewis L. King, postmaster at Waxhaw, N. C.:

"I saw the tornado that passed this town on Sunday, June 20, 1920, from beginning to end. It was a typical summer day, warm, with thunder clouds passing over. A heavy thunder cloud had passed to the north of us, going northeast, a few minutes before the black funnel-shaped cloud appeared, but there was just a light rain in the cloud that passed before the tornado and not much rain in the tornado cloud. There was a mighty roar, somewhat like the roar of a train, and some people actually mistook the noise for a passing train and did not see the tornado. I would say that the path of the storm was not over 200 feet. There was no thunder in the tornado cloud. This was a genuine twister, which suddenly dipped down and was exactly in the shape of a funnel."

From B. P. Hancock, living $2\frac{1}{2}$ miles northeast of Waxhaw, whose home was completely demolished:

"The forenoon was very hot, with a few showers. About 1:30 a small cloud formed in the southwest, moving southeast, and about 20 minutes later another small cloud formed in the northwest, moving toward the northeast, from which thunder was heard three times. After the third thunder it seemed to move back to the southwest, forming into a body like a thunderhead and an awl at the same time. At times it fell to the earth and then rose back up again, and soon formed into a funnel shape, broad at the top and narrow at the bottom. This descended down again and it began to roar and move from the southwest to the northeast. It was dark in the storm as night, but there was no thunder, rain, or hail; there seemed to be a lot of heat inside it."

It is interesting to note that both of these accounts describe the weather as "warm" and "very hot," whereas in Charlotte it was rather cool in the forenoon, the temperature ranging from 62 to 65 up to 11 a. m., when it began to rise, reaching a maximum of 78 at 4 p. m. Cool weather prevailed generally throughout the State, the maxima in the central district ranging from 65 at Winston-Salem to 80 at Albemarle. Monroe, about 10 miles east of the tornado path, had the highest maximum, viz, 83. The heat area mentioned in the above accounts was, therefore, purely local.

There was a thunderstorm in Charlotte from 5:05 p. m. to 6:22 p. m., and frequent showers occurred during the day, the total amount being 1.11 inches. One of these

showers occurred from 1:05 p. m. to 1:50 p. m.; amount, 0.31 inch.

Monroe reported a rainfall of 0.62 for the day.—G. S. Lindgren, Weather Bureau Office, Charlotte, N. C.

TORNADO IN SOUTHEASTERN WYOMING, JUNE 24, 1920.

The Weather Bureau official at Cheyenne, Wyo., has reported the occurrence of a small tornado, accompanied by a severe hailstorm in southeastern Wyoming on the afternoon of June 24. As far as can be learned, the damage was very slight. The tornado swept a path about 200 feet wide and about 12 miles long in the vicinity of Hillsdale and Burns. A few houses, barns, and fences were destroyed, but there was very little damage to stock and no deaths were reported.

The hailstones were unusually large and destructive. Several newspapers contain accounts of hail "as large as good-sized lemons," "medium-sized hen's eggs," English walnuts, and one report from Burns said the hailstones were about 7 inches in circumference. The force of the hail was sufficient to dent the steel roof of railway coaches and did considerable damage to tin roofs. On the whole, however, the storm was not severe, although in appearance it was said by some former residents of the Missouri valley to be a "regular, old-time Missouri twister."—C. L. M.

COLD SHORE WATER OWING TO OFF-SHORE WINDS.

By CHARLES F. BROOKS, Meteorologist.

[Weather Bureau, Washington, D. C., July 28, 1920.]

Reports of unusually cold surf bathing along the New Jersey coast late in July, 1920, led me to examine the wind records of Sandy Hook and Atlantic City. Although there had just been a decidedly cool spell, with northerly winds, and although the spring and early summer averaged 2° or 3° F. below normal in eastern New Jersey, it did not appear that these influences would be sufficient to make the coldness of the water worthy of remark. An unusual amount of off-shore wind, however, would easily account for cold water, because such winds would have driven the warmed surface water out to sea, and cold water from below would have replaced it.

In June, 1920, the off-shore winds—SW., W., NW., and N.—at Sandy Hook blew a total of 4,778 miles, as compared with 2,260 in 1919, and 5,148 in 1918. It is noteworthy that these winds in June, 1920, comprised 54 per cent of all the wind of that month, and that this is not only markedly greater than the 26 per cent of off-shore winds in June, 1919, but also exceeds the off-shore winds of June, 1918, which were 49 per cent of the total—less than half, in spite of the large amount, June, 1918, being unusually windy.

At Atlantic City the average (1914–1920) frequency of off-shore winds, SW., W., NW., and N., at the 8 a. m. and 8 p. m. observations in June is 28, i. e., 47 per cent. In June, 1920, however, the number was 38, or 63 per cent of the total. In July the average frequency of off-shore winds is 34 (31 for 28 days), or 57 per cent, while in the first 28 days in July, 1920, the number of off-shore wind occurrences was 37, or 66 per cent. Thus, in June and most of July this year the off-shore winds have been 27 per cent more frequent than the average of the last seven years, and have occurred about two-thirds of